

PATENT ABSTRACTS OF JAPAN

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(21)Application number : 04-077177 (71)Applicant : TOSHIBA CORP
(22)Date of filing : 31.03.1992 (72)Inventor : HIRAO AKIKO
SUGIUCHI MASAMI

(54) ELECTROPHOTOGRAPHIC SENSITIVE BODY

(57)Abstract:

PURPOSE: To obtain an electrophotographic sensitive body having good repetition characteristics and long life by using a charge transfer layer showing absorption in the absorption wavelength region of a charge generating layer.

CONSTITUTION: This electrophotographic sensitive body has a substantially transparent base body, substantially transparent conductive layer formed on this base body, and photosensitive layer consisting of charge generating layer and charge transfer layer formed on the conductive layer. The charge transfer layer shows the max. absorption wavelength of 450-800nm visible light. Since the light in the wavelength range absorbed by the charge transfer layer is also absorbed by the charge generating layer, the light in this wavelength range is wholly absorbed by the charge generating layer and no light enters to the charge transfer layer for a back exposure method. Thereby, such problems that the electric conductivity in dark time is increased and the charge potential is decreased caused by absorption of light by the charge transfer layer can be avoided and the obtd. photosensitive body can be repeatedly used for image forming.

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CLAIMS

[Claim(s)]

[Claim 1] It is the electrophotography photo conductor which possesses a transparent base and the sensitization layer which consists of a charge generating layer in which it was prepared on this base, and which was substantially established one by one a transparent conductive layer and on this conductive layer, and a charge transportation layer, and is characterized by said charge transportation layer having the maximum absorption wavelength of the light in the range of 450 to 800nm substantially.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Industrial Application] This invention relates to an electrophotography photo conductor, and relates to the electrophotography photo conductor especially used for a tooth-back exposure method.

[0002]

[Description of the Prior Art] An electrophotography photo conductor consists of a base and a sensitization layer formed on this. Although the monolayer mold electrophotography photo conductor with which a sensitization layer consists of one layer, and the laminating mold electrophotography photo conductor with which a sensitization layer consists of a charge generating layer and a charge transportation layer are known by the electrophotography photo conductor, by current, the laminating mold electrophotography photo conductor is more widely used for it.

[0003] Moreover, it exposes to an electrophotography photo conductor and the method which performs exposure from a sensitization layer side, and the tooth-back exposure method which performs exposure from a base side are learned by the process which forms a latent image. By the method which performs exposure from a sensitization layer side, in the case of the common laminating mold electrophotography photo conductor with which the charge transportation layer is formed on the charge generating layer, exposure light needs to penetrate a charge transportation layer, and needs to reach it at a charge generating layer. Therefore, unlike a charge generating layer, as a charge transportation layer, what has small absorption [in / in the maximum absorption wavelength / operating wavelength] has been chosen. However, in such a laminating mold electrophotography photo conductor, since the light of the wavelength region where a charge transportation layer differs from a charge generating layer is absorbed to some extent, the problem that a fall, a remaining electricity rise, etc. of an electrification property arise is unavoidable. Moreover, even if it applied this laminating mold electrophotography photo conductor to the tooth-back exposure method, it will originate in the difference of an absorption wavelength region with a charge transportation layer and a charge generating layer which were mentioned above, and the light which penetrated the charge generating layer will be irradiated by the charge transportation layer. Therefore, in this case, a mist beam and a charge transportation layer will absorb light, and will cause the fall of an electrification property, the rise of remaining electricity, etc.

[0004]

[Problem(s) to be Solved by the Invention] Even if the fall of an electrification property and the rise of remaining electricity in such a charge transportation layer are repeatedly canceled and used for this invention, it aims at offering the electrophotography photo conductor from which a property cannot change easily.

[0005]

[Means for Solving the Problem and its Function] this invention person performs various examination, in order to attain the above-mentioned purpose, and he came to make this invention. That is, it succeeded in development of an electrophotography photo conductor with a good repeat property by using for the absorption wavelength region of a charge generating layer the charge transportation layer

which has absorption.

[0006] This invention possesses substantially a transparent base and the sensitization layer which consists of a charge generating layer in which it was prepared on this base, and which was substantially prepared a transparent conductive layer and on this conductive layer, and a charge transportation layer, and said charge transportation layer offers the electrophotography photo conductor characterized by having the maximum absorption wavelength of the light in the range of 450 to 800nm.

[0007] Although it is good if the base used in this invention is transparent in the wavelength region of the light source to be used so that it can adopt by the tooth-back exposure method, and, as for the wavelength of such a light, 580nm is used abundantly with 630nm and EL by semiconductor laser at 780nm and LED, it is not limited to this. It is transparent in [which is a visible region by usual resin] 400-600nm, and there is much what is maintaining transparency to near 800nm which is a long wavelength field. Therefore, when it is especially made the shape of an endless belt preferably, it is [that a polyvinyl chloride, a polyvinylidene chloride, polyethylene, a polycarbonate, polyester, a polyamide, acrylic resin, polyimide, etc. should just be what has mechanical strength sufficient as a base of a photo conductor] good to choose what can be easily made seamless. Of course, a sheet-like thing may be connected by approaches, such as welding.

[0008] In this invention, if the conductive layer formed in the exposure side side of a base for the purpose of the conductive layer formed on said base, the dust to the exposure side according [corresponding to the need further] to static electricity, antisticking of Chile, etc. is transparent in the wavelength region of the light source used like a base, it is good. Generally as such a conductive layer, a metal, the vacuum evaporation film of a metallic oxide, the thing which calcinated the metal and the metallic oxide after spreading in a certain form or the thing which distributed the binder, and dries or stiffened after spreading the pulverized coal which has conductivity, etc. is mentioned. Electrically, a flow may be taken, and the electric conduction side of these conductive layers may be grounded, and may be grounded separately. In addition, although the conductive layer by which a sensitization layer is formed on it surely needs to be grounded, the conductive layer formed in an exposure side side is not necessarily the reason which needs touch-down.

[0009] As long as the charge generating material used for the charge generating layer in the electrophotography photo conductor of this invention absorbs light and can generate a charge at high effectiveness, what kind of thing is sufficient as it. As charge generating material, for example A selenium and a selenium alloy, CdS, CdSe, Inorganic photoconductors, such as AsSe, ZnO, and an amorphous silicon, a metal phthalocyanine, Azo system coloring matter and pigments, such as phthalocyanine pigments, such as a non-metal phthalocyanine, monoazo, and JISUAZO, A perylene system pigment, indigo system dyes and pigments, the Quinacridone system pigment, anthraquinone, The electron donor acceptor complex which consists of a polycyclic quinone system pigment, cyanine dye, the electronic receptiveness matter, and electron-donative matter, such as anthanthrone, the eutectic complex which consists of a pyrylium color and polycarbonate resin, an AZURENIUMU salt, etc. can be mentioned.

[0010] Although it changes as the formation approach of a charge generating layer also with classes of charge generating material to be used, it can choose from for example, the various applying methods, such as the SUPINKO-TINGU method, a dip painting cloth method, a roller-coating method, and a spray coating cloth method, a vacuum deposition method, the sputtering method, the plasma-CVD method using glow discharge, etc. suitably, for example, and can apply.

[0011] Thus, the obtained charge generating layer has the maximum absorption wavelength of the light in the range of 450 to 800nm. Although the thickness of the charge generating layer which should be formed is suitably determined by the electrostatic property demanded as an electrophotography photo conductor, it is desirable that it is usually about 0.1-5 micrometers.

[0012] It has the maximum absorption wavelength of the light in what [what makes light of the wavelength which a charge generating layer absorbs the maximum absorption wavelength as a charge transportation layer prepared on a charge generating layer], i.e., the range of 450 to 800nm. The difference of the maximum absorption wavelength of the light in a charge generating layer and the

maximum absorption wavelength of the light in a charge transportation layer is more preferably set to less than 100nm. As long as the charge transportation material which constitutes a charge transportation layer conveys a charge and has the maximum absorption wavelength in said range, what kind of thing is sufficient as it. For example, a compound, a hydrazone compound, etc. which have nitrogen ring type compounds, such as polynuclear aromatic compounds, such as an anthracene, a pyrene, a phenanthrene, and coronene, or Indore, a carbazole, oxazole, ion KISAZO-RU, a thiazole, an imidazole, a pyrazole, OKISA diazo-RU, pyrazoline, a thia thiazole, and triazole, are in a principal chain or a side chain. Moreover, as a high molecular compound used as the binder of such charge generating material, known various things are usable. For example, polyethylene resin, Nylon, polyester resin, polycarbonate resin, polyarylate resin, butyral resin, polystyrene resin, the styrene-butadiene copolymer resin, polyvinyl-acetal resin, diallyl phthalate resin, silicone resin, polysulfone resin, acrylic resin, vinyl acetate, polyphenylene oxide resin, alkyd resin, styrene maleic anhydride copolymer resin, phenol resin, paraffin wax, etc. are mentioned. These may be used independently, and two or more sorts may be mixed and they may be used.

[0013] The formation approach of a charge transportation layer has the common approach of performing spreading and desiccation by the general approach, for example, a dip painting cloth etc., and making it into 15-25-micrometer thickness preferably, after predetermined coming out of charge transportation material comparatively, and dissolving in a solvent and considering as a homogeneity solution with a suitable high molecular compound. If the matter which has charge transportation ability is chosen as the high molecular compound itself, the loadings of charge transportation material can be lessened. Moreover, if charge transportation material has sufficient membrane formation nature, combination of a high molecular compound can be stopped to the minimum, and it is also possible to form a charge transportation layer only by charge transportation material depending on the case.

[0014] Although there are various approaches, such as corona discharge by corotron or scorotron, contact electrification, and frictional electrification, when electrifying the front face of the electrophotography photo conductor of this invention, the electrophotography photo conductor of this invention is not limited to the electrification approach at all.

[0015] In the electrophotography photo conductor of this invention, at least one side of an interlayer and a protective layer may be formed if needed. As matter used for the middle class, it is easy to be general things, such as casein, nylon, polyvinyl alcohol, gelatin, a cellulose, and its derivative, and the thickness has 0.1-10-micrometer preferably good about 0.2-2 micrometers. Moreover, as matter used for a protective layer, thermosetting resin, such as thermoplastics, such as known acrylic resin, a fluoro-resin, and silicone resin, phenol resin, and melamine resin, photo-curing, EB, an X-ray, UV hardening resin, etc. are mentioned.

[0016] In this invention, little addition of the additives, such as an antioxidant, an ultraviolet ray absorbent, and an antioxidant, may be carried out at at least one-layer sensitization layer. As such an additive, there are hindered phenols, aromatic amine, an organosulfur compound, phosphite, a chelating agent, a benzophenone system, a benzotriazol system, a nickel complex, etc., for example.

[0017] Moreover, various organic solvents can be used as a solvent used at the time of the charge transportation stratification etc. As a concrete organic solvent, alcohols, ketones, amides, sulfoxides, ether, ester, aromatic series halogenated hydrocarbon, and aromatic series can be used.

[0018] In the electrophotography photo conductor of this invention, when preparing a sensitization layer with a dip painting cloth and a sensitization layer especially adheres to the lower limit section of a base, this adhering sensitization layer can be immersed in the solvent which wipes away with the solvent which dissolves for example, a sensitization layer, or dissolves a sensitization layer, and can be removed. Moreover, when the base to be used is a film made of resin, a base is hollow structure substantially, and if a sensitization layer is formed in such a base with a dip painting cloth method, it will be heavy-gage [the sensitization layer of the lower limit section]. What is necessary is just to wipe away, infiltrating into such a case, for example, the sponge suitable for the configuration of the lower limit section, polyethylene foam, foaming polyurethane, etc. the solvent which dissolves an affix, pressing against them, and carrying out rotation etc. to them. Moreover, it is immersed in the solvent

which dissolves them directly, vertical motion, rotation, etc. are performed, and there is also the approach of carrying out elution of the affix. In addition, when performing these movements, you may take in and out of a solvent tub, and a solvent tub has effective two tub [not one tub but], or two or more **** beam way beyond it in this case. Moreover, a supersonic wave is impressed to a solvent tub, and it is effective even if it performs ultrasonic cleaning. Although seam DOFIRUMU with a knot may be used as such a film made of resin, if a seamless film is used, since a process can be designed without taking a knot into consideration, a more desirable result is given.

[0019]

[Function] In an electrophotography photo conductor, if the light of the wavelength absorbed by the charge transportation layer is irradiated, an unpaired electron detectable by ESR will arise. This unpaired electron is related to a carrier, and will make the electrical conductivity at the time of the dark of a charge transportation layer increase as an electrical property. Therefore, what is necessary is just to use the charge transportation layer which absorbs the light of the wavelength absorbed in a charge generating layer, since the light which penetrated the charge generating layer is irradiated by the charge transportation layer that what is necessary is just to make it light which is absorbed by the charge transportation layer not irradiated in the case of a tooth-back exposure method in order to prevent generating of such an optical induction unpaired electron.

[0020] That is, in the electrophotography photo conductor of this invention, what has the maximum absorption wavelength of the light is used for the range of 450 to 800nm as a charge transportation layer. Since the light of the wavelength which this charge transportation layer absorbs is the light of the wavelength absorbed in a charge generating layer, in the case of a tooth-back exposure method, the light of this wavelength region is altogether absorbed in a charge generating layer, and does not reach a charge transportation layer. Therefore, light is absorbed by the charge transportation layer, the electrical conductivity at the time of dark increases, and electrification potential does not fall.

[0021]

[Example] Hereafter, although the example of this invention is explained, this invention is not limited at all by these examples.

[0022] To both sides of polyester film (240mmx200mm) with a thickness [as example 1 base] of 100 micrometers, the coat of ITO (indium-stannic-acid ghost) was formed and it considered as the conductive layer so that surface electrical resistance might be set to 500 ohms. The long side of this film was welded and the cylinder of 240mmx60mmphi was formed. The dip painting cloth of what dissolved alcoholic solubility nylon (Toray Industries make k-80) in the methanol was carried out so that the thickness after desiccation might be set to 0.6 micrometers, the under-coating layer was formed, next the coating liquid for charge generating stratification was applied to the outside front face of this cylinder so that the thickness after desiccation might be set to 0.2 micrometers, and the charge generating layer was formed in it. As coating liquid for charge generating stratification, what mixed the 50wt% cyclohexanone solution of the polyvinyl butyral (Sekisui Chemical SLEC BM- 1) as a vehicle with the tau type non-metal phthalocyanine (Toyo Ink make) as charge generating material with the ball mill for 24 hours was used.

[0023] Next, the dip painting cloth of the solution which dissolved and obtained to homogeneity the compound 1 and polycarbonate (Teijin formation make K- 1300w) which are shown in Table 1 as charge transportation material by the weight ratio 1 to 1 at 1 and 1.2-trichloroethane was carried out so that the thickness after desiccation might be set to 20 micrometers, and the charge transportation layer was formed.

[0024] Thus, the electrophotography photo conductor of 3 produced lamination was built into the electro photographic printer of a tooth-back exposure method. This incorporates LED as the light source inside a photo conductor cylinder, and each equipment of electrification, development, and an imprint is arranged as usual on the outside of a photo conductor. This electro photographic printer was operated continuously and surface potential was measured.

[0025] Except having used the compound 2 shown in Table 1 as charge transportation material, using dibromo anthanthrone as example 2 charge generating material, the electrophotography photo conductor

was produced like the example 1, it included in the same printer, and surface potential was measured like the example 1.

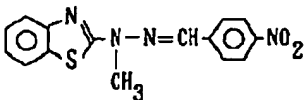
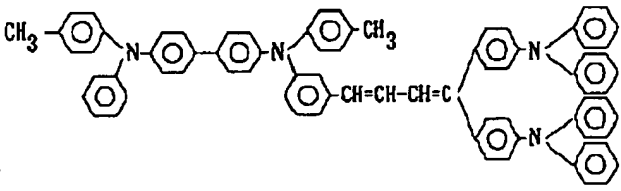
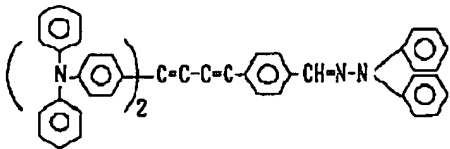
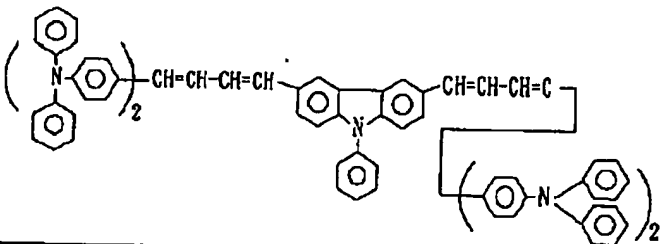
[0026] Except having used the compound 3 shown in Table 1 as charge transportation material, using a tetra-chloro thioindigo as example 3 charge generating material, the electrophotography photo conductor was produced like the example 1, it included in the same printer, and surface potential was measured like the example 1.

[0027] Except having used the compound 4 shown in Table 1 as charge transportation material, using a tetra-chloro thioindigo as example 4 charge generating material, the electrophotography photo conductor was produced like the example 1, it included in the same printer, and surface potential was measured like the example 1.

[0028] Except having used for 345nm the N-ethyl carbazole-3-carboxy aldehyde-methylphenyl hydrazone which has the maximum absorption wavelength of the light as the example 1 of a comparison - 4 charge transportation material, the electrophotography photo conductor was produced like examples 1-4, it included in the same printer, and surface potential was measured like the example 1. The measurement result of the surface potential of examples 1-4 and the examples 1-4 of a comparison was summarized in Table 2.

[0029]

[Table 1]

	分子構造	最大吸収波長 (nm)
化合物1		510
化合物2		570
化合物3		600
化合物4		620

[0030]

[Table 2]

実施例	帯電電位 1万枚印字後 初期	比較例	帯電電位 1万枚印字後 初期
1	0. 9 9 6	1	0. 7 5 5
2	0. 9 8 0	2	0. 6 6 0
3	0. 9 6 5	3	0. 6 5 5
4	0. 9 8 5	4	0. 7 0 0

[0031] To a thing with the large fall of the electrification potential after printing of 10,000 sheets, even if it is after [of 10,000 sheets] printing, the fall of electrification potential comes out only and a certain thing is understood with the electrophotography photo conductor of examples 1-4, with the electrophotography photo conductor of the examples 1-4 of a comparison, so that clearly from Table 2.

[0032]

[Effect of the Invention] As explained above, according to this invention, after many image formation, there are few falls of electrification potential and an electrophotography photo conductor with a long life is obtained.

[Translation done.]